MONEY LOSSES DUE TO DESTRUCTIVE INSECTS

By Harry B. Weiss

It is customary, from time to time, for entomologists to call attention, in text books, special articles, newspapers, etc., to the enormous money losses due to destructive insects. These figures sometimes reach dizzy heights and carry the conviction that cold type seems to have for many readers. Without meaning to lessen the importance of destructive insects in their ability to create real crop losses of considerable magnitude, we would like, in this little article, to cast a few doubts upon the accuracy of the method in use at present whereby these losses are converted into dollars.

In arriving at the percentage of loss by insects, it is customary to obtain estimates indicating to what extent a particular insect has reduced the normal production of a crop to the production actually harvested. Having arrived at a figure indicating a loss in bushels, the value of this lost portion is obtained by basing it on the prevailing average farm price of the crop actually harvested, disregarding the reduction in value which usually follows the marketing of a larger crop. A few authors of papers on the subject of crop losses due to insects admit this error in their figures, but hold to them because of the absence of a better method and because they believe that the enhanced value given to the destroyed portion is offset by other losses chargeable to insects, such as the cost of control, which they have not included.

A quite recent publication cites the potato crop of the United States for 1936 as having been damaged to the extent of 15 per cent by insects. The total actual production of potatoes for that year was estimated at approximately 330,000,000 bushels. Because the supply was below the average that year the farm price went up and was about $1.13 per bushel. Now, if the total production for that year had been 388,000,000 bushels, *i.e.*, the actual production plus 58,000,000 bushels, the estimated loss due to insects, the farm price would, in all probability, have gone down to around 60 cents per bushel, as it was in 1935 or 1937 or 1938, when production stood in proximity to 388,000,000 bushels. The

farm value in 1936 reached a figure of about $370,000,000. If there had been no insect injury and if the production had been 388,000,000 bushels, the farm value at the lower price per bushel, provided the production could have been absorbed by the market, would have been about $233,000,000, which is $137,000,000 less than the farm value of the crop that was reduced by insects and actually produced.

To mention another example, apple production in the United States was supposed to have suffered a loss of 20 per cent in 1936 due to insects. Production for 1936 was estimated as 117,506,000 bushels, or 80 per cent of what the production should have been had there been no insect injury. The farm price for 1936 is quoted as $1.05 per bushel. If the insect damage had been eliminated, the total production would have reached 146,883,000 bushels. Taking into account the purchasing power of the population since 1933, if 146,883,000 bushels had been thrown on the market, the price, in all likelihood, would not have gone higher than 75 cents per bushel, and even this is a generous allowance. The estimated farm value of the apple crop in 1936 was about $123,381,000. With insect injury eliminated, resulting in a crop of 146,883,000 bushels, the total value at 75 cents per bushel would have been $110,162,000, or more than $13,000,000 in favor of the *status quo*. Of course having a crop of 146,883,000 bushels, more labor would be required to harvest, grade, pack and deliver it, provided the bottom did not drop out of the apple market completely. With the complete elimination of insect damage, a state of affairs not likely to happen, there would be some violently painful and long adjustments in the economics of the apple industry. A smaller number of trees would suffice, less labor would be employed and there would be changes all along the line. We have no desire to forecast what would happen to the farm and retail prices, or to the growers, etc., but if insect damage to crops were eliminated or greatly curtailed beyond the present amount, during the adjustment period surpluses would arise to plague us. But of course these could be handed over to some "Agricultural Surplus Commission" to worry about and would be of no concern to entomologists. If the large surpluses could be sold to countries where there were shortages, this would solve the problem, but in

the case of perishable crops, the surpluses might easily be calamitous. In the case of commodities that could be stored, the situation would be better, but even stored commodities in large amounts have a depressing effect upon market prices.

The percentages of damage, to various crops in the United States as a whole, by insects, as given in our text books, seem, for the most part, to run in multiples of 5, such as 5, 10, 15 and 20. Estimates seldom are less than 5 per cent or more than 20 per cent, and these are said to be conservative. To us, these estimates, for the most part, appear rather high for the country at large. They probably represent the opinions of a comparatively small number of technical men rather than the observations of numerous producers. The difficulty of obtaining reliable estimates from either source is fully appreciated. Numerous factors control production and the hazards of farming include not only insects, but plant diseases, defective seed, deficient moisture, excessive moisture, frost, hail, hot winds, storms, etc. Of the factors reducing normal production to the production actually harvested, adverse climate is the most important, and for the most part the effects cannot be avoided. Factors such as insects, plant diseases, poor seed, etc., may be overcome to a certain extent and the losses, due to them, reduced.

If the yield of a certain crop is 10 per cent less than the so-called normal yield, how is one going to apportion this loss to insects, plant diseases, deficient moisture, etc., etc., etc., on the basis of our present knowledge, with any degree of accuracy? With stored products, of course, where only one factor is at work reducing the volume, the operation is not difficult. And there are other instances where insect damage is apparent and separable from injury by other causes and where it can be estimated or arrived at fairly accurately. In the case of a growing crop being injured by one species of insect, perhaps the loss in yield due to the insect can be estimated with some degree of accuracy, but even in this instance, there may be other factors tending to reduce the yield, including adverse climate, plant diseases, etc., and the assignment of loss due to each would be difficult. In the case of a growing crop being injured by several species of insects, the case becomes more difficult, in fact, the difficulties increase as the num-

ber of factors increases. Experimental work designed to isolate, and measure the effect of, single adverse factors in reducing yields would be costly, difficult and perhaps inconclusive. Even if we obtained, by counts in sample areas of a field, some idea of the numerical abundance of different species of insects, there would still remain the difficulty of converting this information into terms of bushels lost due to specific, adverse agents.

The possibility of arriving at a solution seems almost out of the question. On the other hand it would appear to be possible to increase the accuracy of the estimates of the percentages of insect damage to crops, by increasing the number of estimators and by giving them some common, fundamental basis for their estimates and by educating them in the importance of weighing the different factors. We have no confidence in the flat estimates by single individuals covering widespread areas, even whole states, unless it can be shown that such estimates are based upon extensive field observations and counts, where it has been possible to make them, and a full appreciation of the various factors involved. In the case of some estimates we have no doubt that such care is exercised, but entomologists as a rule are not conservative in estimating insect damage, and are inclined to extend to a very large area the estimates that have been based on a very small and unrepresentative sample, and that may represent a special case.

In Mr. J. A. Hyslop's useful paper on "Losses Occasioned by Insects, Mites, and Ticks in the United States" (U.S.D.A. Bur. Ent. and Pl. Quar., Wash., D. C., July, 1938, mimeographed) there is a wide variation in the percentage losses, due to various insects, as gathered by him from different sources and this one would expect. They are, no doubt, as correct as existing facilities and interest in the subject permitted them to be. Many of them seem conservative, especially if one has no definite information with which to check them. Some were no doubt arrived at on the basis of surveys and counts. And they forcibly call attention to the seriousness of insect injury to crops. However, we do not believe that they are all as accurate as it is possible to make them.

When these losses are converted into dollars they total to a staggering sum which includes the enhanced value given to the

destroyed portions of the crops. It is the enhanced values that we believe should be written off in the interest of accuracy. As a matter of fact, the destroyed portions have no market or other value. They don't exist. If insect damage could be eliminated completely, the larger production during the readjustment period would result in a lower price. In trying to give a unit value to something that does not exist, and did not actually come into existence, we either have to give it the same unit value of the crop that does exist, which is not correct, or assume that the increased production due to the elimination of insects could actually be marketed at the lower price. As this is only an assumption and as increased production through elimination of insects, in many cases, would result in a farm value much less than if the reverse happened, *i.e.,* lower production due to insect damage, why is it necessary to attempt to convert bushel losses into dollars? Why not allow these losses in production, when they are arrived at as accurately as possible, to remain in bushels? It is too bad that our standards of value require so many things such as insect damage, college educations, etc., to be valued in terms of dollars.

From an economic viewpoint large farm surpluses at present would not be regarded as blessings. If our present surpluses, due to better methods of production, etc., the dislocation of foreign trade, industrial unemployment, etc., are still further augmented by the elimination of all insect damage, which is highly theoretical, our social and economic life would have to undergo severe readjustments. Before large surpluses can be sold to low income groups, a change in our methods of distribution will have to take place. Economic entomologists should not dream of the complete elimination of all losses due to insects, nor talk as if it would really be desirable for this to happen. They should be content to see their recommendations employed sufficiently to prevent insect damage from reaching the proportions of disaster, or in seeing that such damage is kept down to a reasonable level. Even though they are more ambitious than this, there are always enough lax producers, and insects, to keep production at a level more or less consistent with the economics of the times.